April 2021

Binder 070, Fasciolidae A-L [Trematoda Taxon Notebooks]

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FASCIOLIDAE Railliet, 1895

Syn. Fasciolopsidae Odhner, 1926

Brachycladiidae Faust, 1929

Family diagnosis. — Large flat distomes; suckers usually close to each other, cuticle spined or not. Ceca simple or with dendritic lateral branches, but without anterior diverticles. Testes usually branched, but may be without branches or lobes. Cirrus pouch present. Genital pore preacetabular. Ovary branched or entire; seminal receptacle reduced or absent. Laurer's canal present. Vitellaria profusely developed, lateral, confluent posteriorly. Uterus with relatively few coils; eggs large. Excretory vesicle tubular. Parasites of mammals.

Type genus: *Fasciola* Linnaeus, 1758.

Key to subfamilies of Fasciolidae [1])

1. Ceca simple 2
   Ceca dendritic ..... Fasciolinae
2. Testes entire ..... Protofasciolinae
   Testes branched ..... Fasciolopsinae

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[1]) According to Odhner, *Fascioletta ilocanum* Garrison, 1908, is a typical *Echinostoma*, so this genus is excluded from the family under consideration. *Protofasciolopsis* Odhner in Fuhrmann, 1928 (p. 121) is known to us only by name.

Fasciolinae Stiles et Hassall, 1898

Subfamily diagnosis. — Fasciolidae: Body very large, broad, oval to spatulate, foliate, spinose, with or without cephalic cone. Oral sucker and pharynx small, esophagus short. Ceca long, dendritic, reaching to posterior extremity. Acetabulum small, close to anterior extremity. Testes tandem, profusely branched. Cirrus pouch small, anterodorsal to acetabulum. Genital pore bifurcal or postbifurcal. Ovary submedian, branched. No receptaculum seminis. Vitellaria extending in whole lateral fields of hindbody, dorsal and ventral to ceca, or confined to ventral area. Uterus coiled between ovary and acetabulum. Excretory vesicle long, with numerous anastomosing branches.

Key to genera of Fasciolinae

Cephalic cone distinct; vitellaria both dorsal and ventral to ceca ..... *Fasciola*

No distinct cephalic cone; vitellaria ventral to ceca ..... *Fascioloides*

Family FASCIOLIDAE Railliet, 1895

Synonyms.—Fasciolopsidae Odhner, 1926, p. 4; Campulidae Odhner, 1926, p. 5; Brachycladiidae Faust, 1929, p. 88.

Family diagnosis.—Large flat forms; suckers relatively close together; cuticle with or without spines. Intestinal ceca simple or with lateral dendritic branches. Excretory bladder simple and tubelike, or profusely branched. Genital pore preacetabular; cirrus pouch present; cirrus armed or unarmed. Testes usually profusely branched, but may be without branches or lobes. Ovary branched or entire; seminal receptacle reduced or absent; Laurer's canal present. Vitellaria profusely developed, consisting of numerous follicles situated along the sides of the body and becoming confluent posteriorly. Uterus with relatively few coils; eggs large, either circular or triangular in cross section.

Type genus.—*Fasciola* Linnaeus, 1758.

KEY TO SUBFAMILIES OF FASCIOLIDAE CONTAINING SPECIES PARASITIC IN MARINE MAMMALS

1. Body flat, leaflike; testes and ovary profusely branched; eggs without thickening at posterior pole, circular in cross section. **Fasciolinae** (p. 3).

   Body elongated and slightly flattened, but not leaflike; testes and ovary usually unbranched; eggs with thickening at posterior pole, usually triangular in cross section_____ **Campulinae** (p. 5).

Subfamily FASCIOLINAE Stiles and Hassall, 1898

Subfamily diagnosis.—Fasciolidae: Body flat and leaflike. Intestinal ceca profusely branched, the branches being dendritic and mainly lateral. Excretory vesicle with lateral branches. Testes profusely branched; cirrus pouch not extending beyond posterior margin of acetabulum; cirrus unarmed. Ovary branched. Eggs without thickening at posterior pole, circular in cross section. Parasites of herbivorous or omnivorous mammals.

Type genus.—*Fasciola* Linnaeus, 1758.

Subfamily CAMPULINAE Stunkard and Alvey, 1930

Synonym.—Brachycladiinae Odhner, 1910c, p. 165.

Subfamily diagnosis.—Fasciolidae: Elongated, medium-sized to very large flukes; body relatively narrow and thick. Cuticle armed with relatively large, pointed spines. Suckers close together in some genera and rather widely separated in others. Digestive system H shaped, except in *Odhneriella;* anterior ceca short; posterior ceca long, sinuous and extending to posterior end of body; diverticula, when present, are both median and lateral. Excretory vesicle tubelike, without lateral branches. Genital aperture preacetabular; cirrus pouch frequently extends far caudad of acetabulum; cirrus armed or unarmed. Testes slightly or deeply lobed, or smooth, tandem in position, and situated not far caudad of ovary. Ovary smooth or slightly lobed; seminal receptacle much reduced in size or absent; Laurer's canal present. Vitellaria well developed. Uterus with relatively few loops; vagina with or without spines. Eggs with thickened posterior pole, usually triangular in cross section. Parasites of marine mammals.

Type genus.—*Campula* Cobbold, 1858.

KEY TO THE GENERA OF THE SUBFAMILY CAMPULINAE

1. Cirrus unarmed ---------- 2.
   Cirrus armed ---------- 4.
2. Body slender, 60 mm to 80 mm long; ovary deeply lobed; vitellaria in more or less rectangular masses of follicles ---------- **Lecithodesmus** (p. 11).
   Body more robust, less than 20 mm long; ovary not lobed; vitellaria not as above ---------- 3.
3. Oral sucker much larger than acetabulum; eggs circular in cross section ---------- **Zalophotrema** (p. 13).
   Oral sucker and acetabulum about equal in size; eggs triangular in cross section ---------- **Campula** (p. 6).
4. Vagina unarmed; vitelline follicles in distinct masses ---------- 5.
   Vagina armed; vitelline follicles not in distinct masses ---------- 6.
5. Anterior ceca absent; in liver of pinnipeds ---------- **Odhneriella** (p. 20).
   Anterior ceca present; in intestine of cetaceans ---------- **Hadwenius** (p. 17).
6. Testes deeply lobed; intestinal ceca with median and lateral diverticula ---------- **Synthesium** (p. 16).
   Testes not deeply lobed; intestinal ceca without median and lateral diverticula ---------- **Orthosplanchnus** (p. 14).

Fasciola Linnaeus, 1758

Syn. *Cladocoelium* Duj., 1845

Generic diagnosis. — Fasciolidae, Fasciolinae: Body large, broad, flat, foliate, with distinct head cone. Cuticle with scale-like spines. Oral sucker subterminal, prepharynx short, pharynx well developed, esophagus short. Ceca long, reaching to posterior extremity, provided with numerous, long, dendritic, outer branches, and fewer, shorter, inner branches. Acetabulum at base of cephalic cone, of nearly the same size as oral sucker. Testes profusely branched, tandem, occupying greater part of postovarian intervitellarian field. Cirrus pouch anterodorsal to acetabulum, not extending further backward beyond it. Genital pore at intestinal bifurcation. Ovary branched, submedian, pretesticular. Seminal receptacle absent; Laurer's canal present. Vitellaria very profusely developed, extending in lateral fields both dorsal and ventral to ceca from behind base of cephalic cone to extreme posterior end of body. Uterus coiled in form of a rosette between acetabulum and ovary; eggs large, circular in cross section. Excretory vesicle long, slender, with numerous lateral branches which form an extensive dorsal and ventral network. Parasitic in bile ducts of mammals, especially of herbivores.

Genotype: *F. hepatica* Linnaeus, 1758 (Pl. 93, Fig. 1125), in herbivorous mammals and man (type host: *Ovis aries*); cosmopolitan. In *Rattus rattus;* Formosa — Li (1952). The two records from cetaceans may have been the result of mislabeling — Price (1932).

For earlier studies on the life history see Leuckart and Braun-Seifert. Oculate miracidia intrude actively into *Lymnaea truncatula* and other species of *Lymnaea;* cercaria develops in redia in about 5 weeks after infection, and encysts on vegetation. *Pseudosuccinea columella* serves as a potentially important intermediate host in extending the range of *Fasciola hepatica* — Krull (1933). Cercaria from *Lymnaea truncatula* described — Rees (1932), Wesenberg-Lund (1934). The life cycle is completed in *Lymnaea philippinensis* in from 35 to 48 days in the laboratory and in from 44 to 48 days in the field; free swimming cercariae are not infective — Jesus (1935); various developmental stages in snail host *Fossaria ollula* — Alicata (1938). For list of vectors see Stiles and Hassall (1926, 29). *Limnaea truncatula* [sic] in Japan — Ono et al. (1953). *Physa acuta* — Higashi (1955), *Simlimnaea subaquatalis* — Gordon (1955).

Other species:

- *F. californica* Sinitzin, 1934. Larval stages in *Galba bulimoides*, adult experimentally in rabbit; California.
- *F. gigantica* Cobbold, 1855, syn. *Cladocoelium giganteum* Stoss., 1892 — Tabunshtikova, 1932, in liver of *Giraffa camelopardalis*, zebra, *Capra, Ovis, Buffelus, Bos;* cosmopolitan. Also reported for man.

  Cercaria pigmentosa Cawston, 1919; vectors: *Lymnaea natalensis, Physopsis africana.*

  Miracidia with epidermal cells in 6 : 6 : 3 : 4 : 2 formula; cercaria developed in daughter rediae in *Lymnaea acuminata*, emerged in 38 days in April, 65 days in February, at Lucknow, India, encysted on vegetation, vessel, snail hosts; guinea pigs successfully infected experimentally. Development from egg to adult varied from 2½ to 4½ months — Thapar and Tandon (1952).
- *F. halli* Sinitzin, 1934, in cattle and sheep, Texas and Louisiana; larval stages in *Galba bulimoides techella.*
- *F. indica* Varma, 1953, in *Bos indicus, B. bubalus, Capra hircus, Sus cristatus;* India.
- *F. jacksoni* (Cobbold, 1869), syn. *Cladocoelium elephantis* Dies., 1853 — Bhalerao, 1933, in *Elephas indicus;* India.

Fasciolidae
Fasciolinae

FASCIOLA Linnaeus

Body large, broad, flattened, leaf-shaped, covered with minute spines, the anterior end set off in a cone-like projection. Acetabulum near anterior end. Pharynx present esophagus short, intestinal crura much branched, extend to posterior end of body. Excretory vesicle much branched.

Genital pore median, directly before the acetabulum. Cirrus sac well developed. Testes median, one before the other, branched.

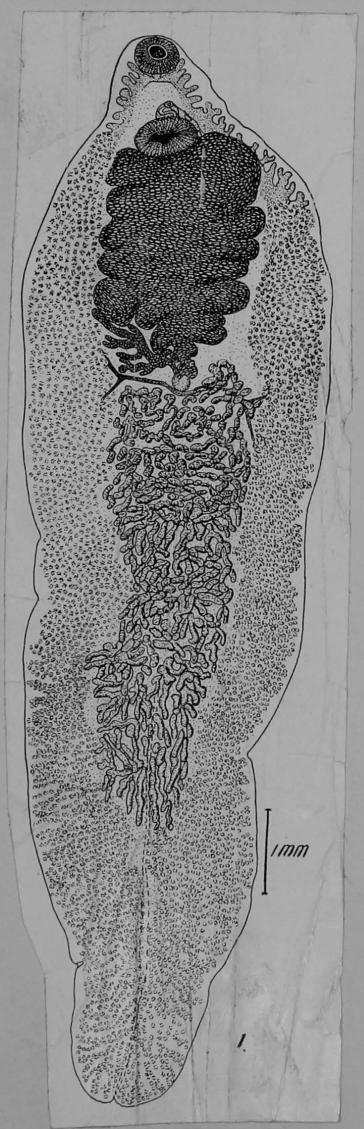
Ovary lateral, anterior to testes, richly branched; seminal receptacle lacking. Laurer's canal present, vitellaria extensive, in the lateral areas and in the posterior region on both dorsal and ventral sides of the body. Uterus short, in compact coil, preovarian. Eggs large, thin-shelled; parasites of the gall passages of mammals.

Type: F. hepatica Linnaeus, 1758

Other species: F. gigantica Cobbold, 1855
F. magna

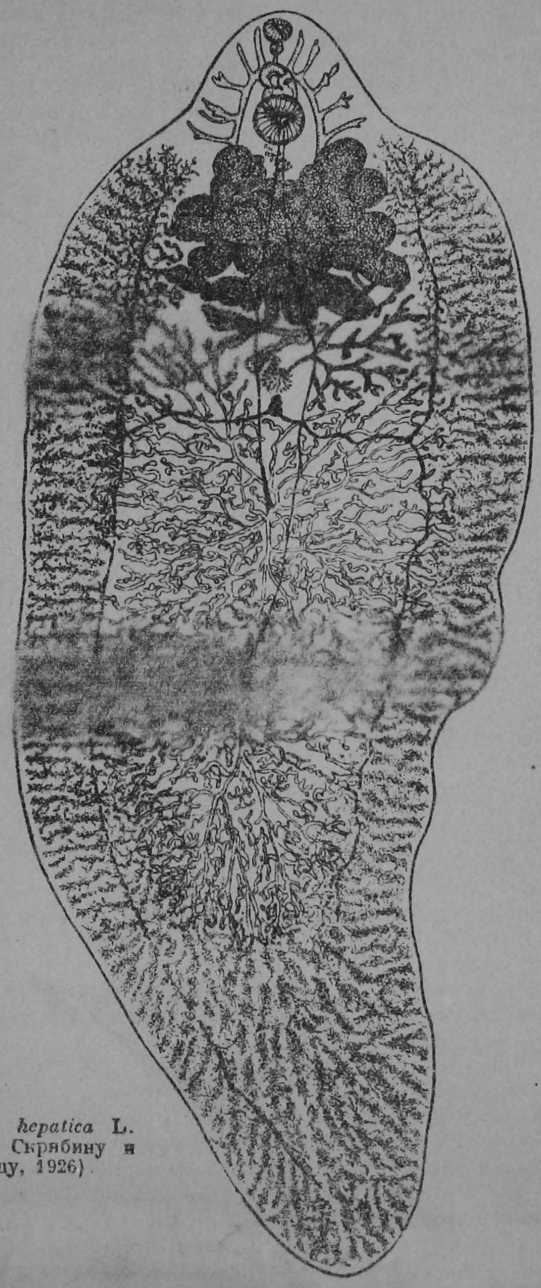
from Stunkard

F. jacksoni Cobbold, 1869
see Chatterji, 1938



F. hepatica from Price

Сем. FASCIOLIDAE



1. Fasciola hepatica L. 1758 (по Скрябину и Шульцу, 1926)

"AFTER STILES" FROM PRATT, 1902

FASCIOLA

F

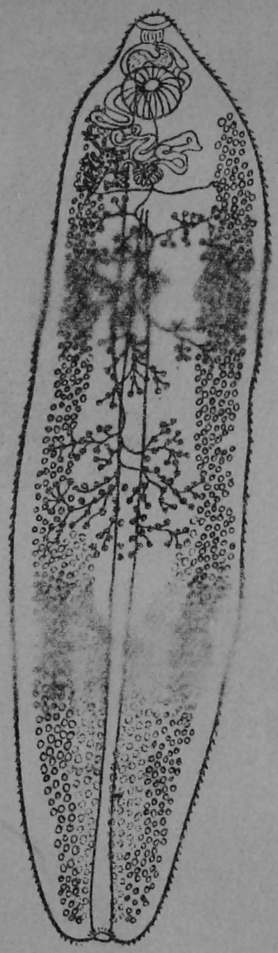
Jackson (1921, in Parasitology vol.13) considers F.angusta (Railliet) and F.aegyptiaca synonyms of F.gigantica.

He gives the following key.

(1) Yolk glands ventral to gut.....2
Yolk glands on both sides of gut. 3

(2) Body very large and thick; cone not very distinct; esophagus 1½ to 3 times as long as pharynx.....F.magna
Body slender and awl shaped; cone very large and distinct; esophagus exceedingly short...F.nyanzi

(3) Body at least 3 times as long as broad; "shoulders" absent or indistinct; internal branches of gut numerous and branched.....F.gigantica
Body broad and leaf shaped;cone sharply set off from body on wide "shoulders"; internal branches of gut few and little if at all branched.....F.hepatica



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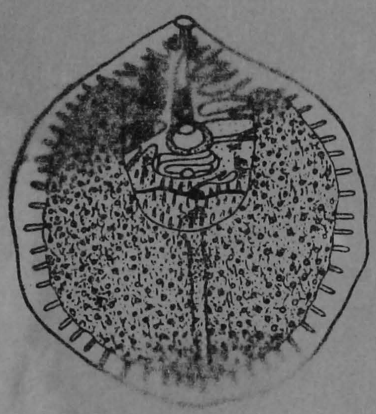
8. Fasciola gigantica (Cobbold, 1855) (no Faust, 1939)



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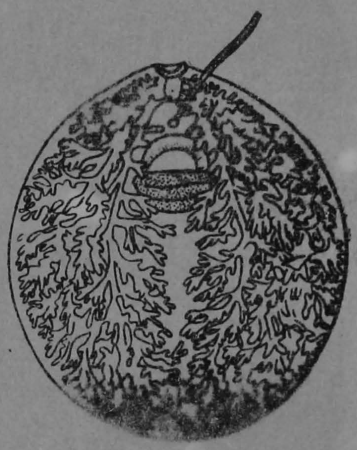


22 a

22 и 22 a. *Fasciola jacksoni* (Cobbold, 1869) (по Evans и Rennie, 1909)

Fasciola tragelaphi ~~sp. nov.~~ PIKE AND CONDY, 1966

Table 1. *Measurements of five stained and mounted worms*

		Range (mm)	Average (mm)
Body	Length	102–120	111·4
	Breadth	6·0–7·0	6·60
Cephalic cone	Length	2·96–3·33	3·18
Oral sucker	Length	0·592–0·666	0·636
	Breadth	0·814–0·888	0·844
Pharynx	Length	0·814–0·888	0·829
	Breadth	0·370–0·444	0·414
Ventral sucker	Length	1·332–1·480	1·420
	Breadth	1·332–1·554	1·465
Cirrus pouch	Length	1·332–1·480	1·406
	Breadth	0·518–0·666	0·590
Distance of testes from anterior		4·10–5·80	4·90
Mehlis's gland	Length	1·480–1·702	1·628
	Breadth	0·814–0·964	0·903
Distance of Mehlis's gland from anterior		2·30–2·90	2·60
Anterior limits of vitellaria	Left	1·90–2·70	2·30
	Right	1·20–2·20	1·80

HOST: TRAGELAPHUS SPEKEI ROTHSCHILD, SITATUNGA

LOCALITY: CHOBE SWAMPS, RHODESIA

DISCUSSION

F. tragelaphi is clearly a member of the genus *Fasciola*, since it has a distinct cephalic cone and the vitellaria lie both dorsally and ventrally to the gut-caeca, but it shows several marked differences from the other species of the genus.

The enormous length of this species, which was a consistent feature of the eighteen specimens examined during this study, is far in excess of any other described species of *Fasciola*, with the exception of *F. nyanzae* Leiper. Leiper (1910) gave the length of his specimens as 6·9 cm, but more recently Dinnik & Dinnik (1961) have described specimens measuring up to 9·1 cm in length. *F. tragelaphi*, however, differs markedly in shape from *F. nyanzae*, for whereas the latter is widest across the 'shoulders' and tapers towards its posterior, *F. tragelaphi* is widest in the posterior third of the body and relatively narrow across the 'shoulders'. To what extent the shape varies in life is unknown, but in fixed specimens it appears to be quite constant.

The position and arrangement of the genitalia show certain differences from all other species of *Fasciola*. First, whereas the ovary is usually unilateral, mostly lying to the right of the median line, in *F. tragelaphi* it is always bilateral, with two equal parts lying to the right and left of Mehlis's gland. Dinnik & Dinnik (1961) do refer to one specimen of *F. nyanzae* in which they found that the ovary was bilateral, but this only occurred in one of the seventeen specimens. Tandon (1956), in his description of *Fasciola indica* Varma, has also referred to this condition: he states that 'In some flukes the ovary is placed in the median line of the body with half of the branches on the left and half on the right'. Secondly, the uterus in the present species lies loosely coiled between the main gut-caeca and is not, as in other species, found in a tightly coiled mass lying immediately behind the ventral sucker. Thirdly, the testes are widely separated from the female genitalia since they usually lie almost entirely in the posterior half of the body.

It is of interest that the major differences in the morphology, which this worm shows from the other species of *Fasciola*, appear to be due to a prolongation of the anterior part of the body, which has resulted in the separation of the testes from the female genitalia, and the spreading out of the uterus.

The presence of a ventral diverticulum of the prepharynx in *Fasciola hepatica*

– OVER –

was noted by Mehlis (1825), but he considered it to be a part of the prepharynx, whereas Leuckart (1863) regarded it as a separate organ. Stiles (1894) found the same organ in *Fascioloides magna*, but agreed with Mehlis that this was not a separate organ. Varma (1953) and Tandon (1956) have described an identical pouch in *Fasciola indica*.

Because of the uncertainty as to whether this pouch is a distinct organ or not, we have examined as many species of the genus *Fasciola* as possible, to determine the structure of the organ and compare it in the various species. Thus *F. hepatica*, *F. gigantica*, and *F. nyanzae*, as well as *F. tragelaphi*, were sectioned transversely and longitudinally and examined for the pouch. All the species examined show that the pouch is distinct, asymmetrical and possesses a musculature similar to that found in *F. tragelaphi*. Sections of the pouch in *F. hepatica* and *F. gigantica* are illustrated in the Plate, figs. 5 and 6 respectively. Furthermore, sections of immature *F. hepatica* have shown that the pouch is present in worms less than 1 cm in length.

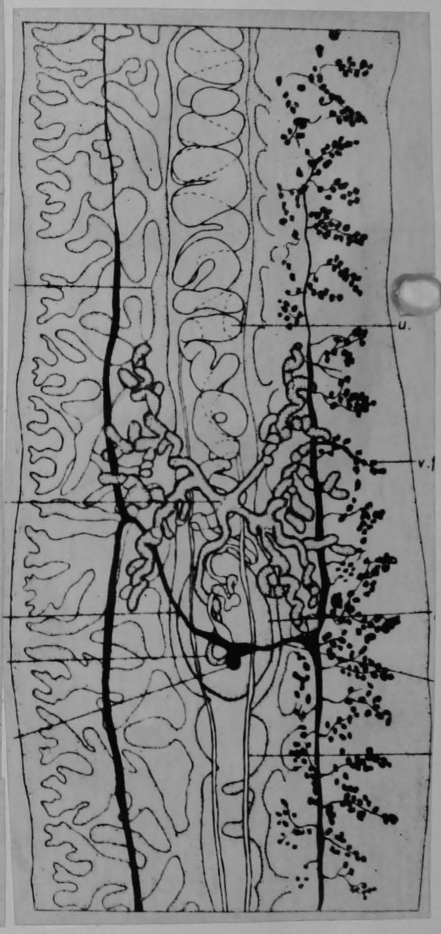
A prepharyngeal pouch thus appears to exist in both genera comprising the Fasciolinae, but to what extent it occurs in genera belonging to the other subfamilies of the Fasciolidae is unknown. Apparently, a similar organ is also known in at least one species of *Campula* Cobbold, *C. folium*, as described by Osaki (1935).

Little is known about the function of this pouch, even though much has been done on feeding in various species of *Fasciola*. According to Leuckart, Pagenstecher suggested that the pouch assisted the action of the suckers and Walter thought that it was a salivary gland. More recently, Engbert (1962) has observed this pouch in *F. hepatica* and considers that it and the prepharynx as a whole allow the pharynx to move forwards and backwards during feeding.

Williams (1961) has described and discussed a 'bucco-intestinal' canal in *Polystoma integerrimum* (Frölich) from frogs. This is a tube which runs from the junction of the oral sucker and pharynx to the intestine. Similar structures have been noted in other related monogeneans, and it is interesting to compare them with the prepharyngeal pouch described here, although no suggestions concerning their relationship, if any, can be made without further study.

It does not seem possible at present to suggest a function for this prepharyngeal pouch, but it is to be hoped that more detailed studies, histologically, histochemically and *in vitro* may provide the answer and reveal the rôle of this structure in the living *Fasciola*.

Finally, it is interesting to note that although *F. tragelaphi* is common in sitatunga in the Chobe swamps, it has not been found yet in red lechwe, *Kobus leche*, which are numerous in the area and which graze the same swampland.



SUMMARY

Fasciola tragelaphi sp.nov. from the bile ducts of a *Tragelaphus spekei* shot in the Chobe swamps of Rhodesia differs from other species of the genus in its very large size (10·2–12·0 cm long in fixed and mounted specimens), in the shape of its body and in the distribution and arrangement of the reproductive organs. The testes lie almost entirely in the posterior half of the body, well away from the female genitalia, which lie mostly in the anterior third of the worm. The ovary is always bilateral, and the coiled uterus runs in a straight line between the caeca to the genital atrium. A prepharyngeal pouch found in this species is compared with that found in other members of the genus *Fasciola* and in related genera.

FASCIOLA

LOOSE LEAF
ORGANIZER

SCHEDULE

PERIOD OR TIME								
COURSE **MON.** INSTRUCTOR								
COURSE **TUE.** INSTRUCTOR								
COURSE **WED.** INSTRUCTOR								
COURSE **THU.** INSTRUCTOR								
COURSE **FRI.** INSTRUCTOR								
COURSE **SAT.** INSTRUCTOR								

NAME _____

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CAMPULIDAE Odhner, 1926

Family diagnosis. — Elongate distomes: Cuticle spined. Suckers close to each other or wide apart. Ceca usually with anterior diverticles. Cloaca may be present. Testes tandem in hindbody, intercecal. Cirrus pouch present. Genital pore pre-acetabular. Ovary pretesticular. Vitellaria profusely developed in hindbody, may intrude into forebody or not. Uterus coiled between ovary and genital pore. Eggs usually triangular in cross section. Excretory vesicle tubular. Parasites of marine mammals.

Type genus. *Campula* Cobbold, 1858.

Key to subfamilies of Campulidae

1. Ceca without anterior diverticula ..... Synthesiinae
   Ceca with anterior diverticula 2
2. Vitellaria consisting of quadrangular groups of follicles; acetabulum far apart from anterior extremity; ceca with outpocketings ..... Lecithodesminae
   Vitellaria bunch-like, confined to hindbody; acetabulum in anterior third of body; ceca without outer and inner outpocketings ..... Odhneriellinae
   Vitellaria extending profusely whole length of ceca; acetabulum in anterior third of body 3
3. Ceca with numerous outer and inner outpocketings Campulinae
   Ceca without outpocketings ..... Orthosplanchninae

Campulinae Stunkard et Alvey, 1930

Subfamily diagnosis. — Campulidae: Body fusiform, linguiform, or subcylindrical, spinose. Oral sucker comparatively small or large; prepharyngeal pouch present or absent. Esophagus absent, ceca with anterior, outer and inner diverticula; cloaca present or absent. Acetabulum small, in anterior third of body. Testes lobed or branched, directly tandem in midregion of body. Cirrus pouch may or may not extend posterior to acetabulum. Genital pore preacetabular. Ovary submedian or nearly median, pretesticular. Receptaculum seminis reduced or absent. Vitellaria extending profusely in lateral fields almost entire length of body or ceca, may or may not be confluent in postbifurcal and postesticular region. Uterus coiled in intercecal field anterior to ovary.

Key to genera of Campulinae

Prepharyngeal pouch and cloaca present; eggs triangular in cross section ..... *Campula*

Prepharyngeal pouch and cloaca absent; eggs circular in cross section ..... *Zalophotrema*

Campula Cobbold, 1858

Syn. *Brachycladium* Looss, 1899

Generic diagnosis. — Campulidae, Campulinae: Body subcylindrical, fusiform to linguiform, more or less flattened. Cuticle spined all over. Oral sucker slightly smaller than acetabulum, prepharynx produced backward over ventral surface of pharynx in form of an elongate pouch. Pharynx pear- or flask-shaped. Esophagus very short. Ceca with anterior diverticles and short outer and inner diverticles; cloaca present. Acetabulum within anterior third of body. Testes lobed or not, tandem, in middle third of body for most part. Cirrus pouch curved, claviform, may or may not extend back of acetabulum. Genital pore immediately preacetabular. Ovary entire, more or less submedian, pretesticular. Seminal receptacule reduced. Laurer's canal present. Vitellaria extending profusely in lateral fields almost throughout length of body, may be confluent in postbifurcal and posttesticular regions, partly covering testes or not. Uterus coiled in pre-ovarian intercecal field. Eggs triangular in cross section. Excretory vesicle tubular, long. Parasitic in bile ducts of marine mammals.

Genotype: *C. oblonga* Cobbold, 1858, syn. *Brachycladium o.* (C.) Looss, 1902 (Pl. 86, Fig. 1036), in *Phocaena phocaena;* Europe, N. America. Also in *Phocaenoides dalli;* Sea of Japan.

Other species:

C. folium Ozaki, 1935, in *Neophocaena phocaenoides;* Japan.

C. palliata (Looss, 1885) Looss, 1901 should be transferred to *Lecithodesmus* Braun on account of the suckers being widely separated. See p. 848.

C. rochebruni (Poirier, 1886) Bittner et Sprehn, 1928, in *Delphinus delphis;* Europe.

CAMPULA OBLONGA Cobbold, 1858

PLATE 1, FIGURES 2–5

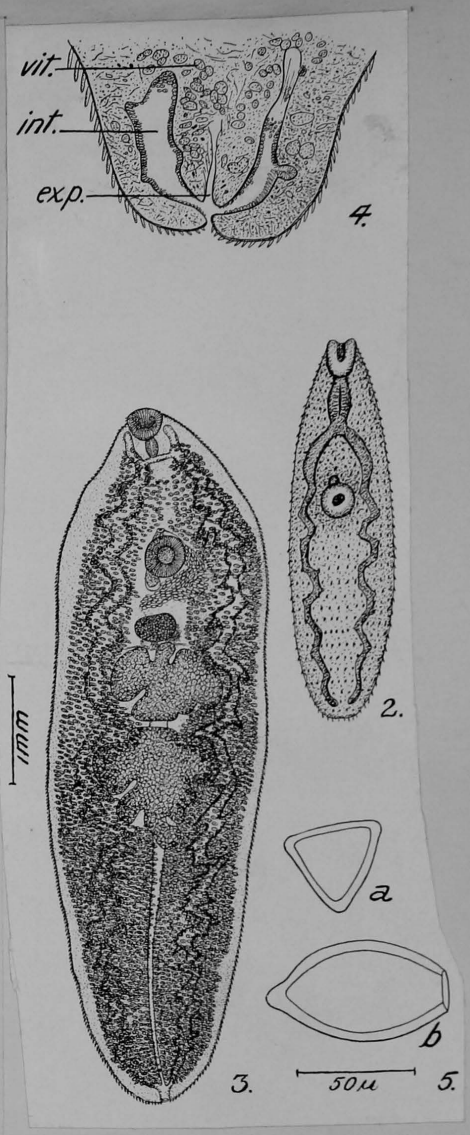
Synonyms.—*Distomum oblongum* (Cobbold, 1858) Braun, 1892, p. 99; *Distomum* (*Brachylaimus*) *oblongum* (Cobbold, 1858) Stossich, 1892, pp. 16–17; *Brachycladium oblongum* (Cobbold, 1858) Looss, 1902, p. 716; *Distomum tenuicolle* Rudolphi of Olsson, 1893, p. 9.

Description.—*Campula:* Body elongate, 4 to 7 mm long by 1 to 3 mm wide, anterior end obtuse, posterior end rounded. Cuticle armed with pointed spines, 44μ long by 14μ wide, arranged in alternating transverse rows. Oral sucker subterminal, 310μ to 340μ in diameter; acetabulum 430μ to 465μ in diameter, situated a little less than one-fourth of the body length from the anterior end. Prepharynx very short and wide; pharynx piriform, 310μ to 360μ long by 170μ to 220μ wide; esophagus about 100μ long. The short, anteriorly directed, intestinal ceca extend beyond posterior margin of the oral sucker and are not provided with lateral diverticula; the posteriorly directed branches are more or less zigzag and extend to the posterior end of the body, where they open into a depression in common with the excretory vesicle; the posterior branches of the intestine are provided with short median and lateral diverticula. The excretory vesicle is tubelike and extends anteriorly, dorsal to testes, to the level of the posterior margin of the ovary; it is slender at the posterior end, but becomes progressively wider anteriorly. The genital aperture is situated immediately cephalad of the acetabulum; genital sinus small. Cirrus pouch somewhat pestle shaped, slightly curved, and extending caudad to a point about midway between the posterior margin of acetabulum and the anterior margin of ovary. The greater part of the cirrus pouch is filled with a sinuous seminal vesicle. Cirrus unarmed, protrusible. The testes are deeply lobed, tandem in position, and occupy the equatorial third of the body; the anterior testis is 620μ to 770μ long by 770μ to 990μ wide, and the posterior testis in 620μ to 1 mm long by 770μ to 1.2 mm wide. Ovary transversely oval, 186μ to 372μ long by 310μ to 527μ wide, situated immediately cephalad of anterior testis and to the right of the median line. Seminal receptacle greatly reduced in size or (?) absent (Nicoll described a small seminal receptacle, but the writer has been unable to demonstrate this structure in the specimens at his disposal); Laurer's canal present. Vitellaria abundantly developed, the follicles being distributed over the entire dorsal surface from the level of the posterior end of the esophagus to the posterior end of body; ventrally the follicles do not extend medially much beyond the inner limits of the intestine in the testicular and pretesticular zones, but completely fill the posttesticular zone. The uterus is relatively short, consisting of a few loops confined to the intercecal field between the ovary and acetabulum; vagina about one-half the length of cirrus pouch, muscular, and without spines. Eggs 90μ to 97μ long by 45μ wide, oval in outline, but more or less triangular in cross section; shell yellow, thickened to form a knoblike projection at posterior pole; opercular pole flat.

Host.—*Phocaena phocoena* (=*Phocaena communis*).

Location.—Bile ducts.

Distribution.—Europe; North America (United States).



Remarks.—The above description is based upon specimens (U.S.N.M. Helm. Coll. No. 8415) collected by Dr. G. A. MacCallum, June 27, 1925, from the liver of *Phocaena phocoena* at Woods Hole, Mass. Two additional lots of specimens have also been examined. The first of these (U.S.N.M. Helm. Coll. No. 3379) was collected by Prof. Max Braun from the liver of *Phocaena communis* at Warnemünde, and identified as *Campula oblonga*. The date of collection is not given, but it is probable that this is a part of the material upon which his (1900) description of this species is based. The second lot of specimens (U.S.N.M. Helm. Coll. No. 16682) is labeled "*Campula oblonga*, liver, *Phocaena communis*, Millport, August 15, 1908, determined by Wm. Nicoll." In the case of this material, there appears to be no doubt that this represents a part of the specimens described by Nicoll in 1909. The specimens comprising both of these lots agree in all essentials with those from the MacCallum collection.

One of the outstanding characters which distinguish *C. oblonga* from all other species of the genus is the presence of anal openings. These structures are quite distinct and were found to occur in all specimens examined.

Anal openings have been reported as occurring in species belonging to the family Echinostomatidae by Leiper (1908) and by Odhner (1910c); in the Steringophoridae by Odhner (1911); in the Accacoeliidae by Looss (1912); in the Azygiidae and Allocreadiidae, and in *Schistorchis carneus* (syn. *Pleorchis oligorchis;* family uncertain) by Odhner (1928); in the Opecoelidae by Ozaki (1925; 1928); and in the Diploproctodaeidae by LaRue (1926) and by Ozaki (1928). Stunkard (1930) also demonstrated the presence of these openings in *Distomum* sp. of Linton, 1899, and proposed a new genus and species, *Bianium concavum*, for this trematode.

The genetic significance of the occurrence of anal openings in these worms is not clear. In two of the families, Opecoelidae and Diploproctodaeidae, these structures are present in all species included in these groups; in other families, however, this does not hold true. So far as the family Fasciolidae is concerned, *C. oblonga* is the only species known to possess these structures; it appears, therefore, that anal openings in some species are characters of specific rather than generic or family significance.

[a young male harbor porpoise, *Phocaena vomerina* (Gill) 1865] examined summer, 1958, at Friday Harbor Marine Laboratories

The liver of the same porpoise contained specimens of *Campula oblonga* Cobbold, 1858. These parasites were numerous both immediately beneath the serous membrane and in bile ducts. This species has been previously reported in *Phocaena phocaena* (L.) of Europe and North America and in *Phocoenoides dalli* of Japan.—HILDA LEI CHING AND EDWARD S. ROBINSON, *Zoology Department, University of Nebraska.*

Reprinted from the Journal of Parasitology, 1959, Volume 45, (2): 181.

CAMPULA PALLIATA (Looss, 1885) Looss, 1901

PLATE 2, FIGURES 6–7

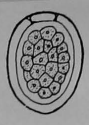
Synonyms.—Distomum palliatum Looss, 1885, pp. 390–427; *Brachycladium palliatum* (Looss, 1885) Looss, 1899, p. 558; *Cladocoelium palliatum* (Looss, 1885) Stossich, 1892, pp. 10–11.

Description.—Campula: Body elongated, 9 mm to 10 mm long by 1.5 mm to 2 mm wide and 750μ to 1 mm thick; the anterior end is more rounded than the posterior end, and there is a definite constriction of the body in the vicinity of the acetabulum. Cuticle armed with closely set rows of pointed spines, 62μ to 76μ long by 5μ to 8μ wide, which completely cover the body. Suckers about equal in size and situated 2.5 mm to 3.5 mm apart. Pharynx ovoid, 380μ long by 293μ wide; esophagus 540μ wide. The intestinal tract consists of a pair of anteriorly directed ceca, one on each side, which extend to the level of the oral sucker, and a pair of posteriorly directed ceca, which extend to the posterior end of the body, both pairs of ceca being provided with short median and lateral diverticula. Excretory vesicle tubular, extending anteriorly dorsal of testes and dividing into two branches. Genital aperture median and situated a short distance cephalad of acetabulum. Cirrus pouch strongly muscular and situated mostly in front of acetabulum; it contains the seminal vesicle, ejaculatory duct, and cirrus. Testes lobed, tandem in position, situated in posterior part of middle third of body. Ovary irregular in outline, 489μ in greatest diameter, situated to left of median line and cephalad of anterior testis; seminal receptacle small; Laurer's canal present. Vitellaria abundantly developed and consisting of grapelike follicles, which extend from region of pharynx to posterior end of intestinal ceca. Uterus consists of numerous coils situated dorsal to acetabulum. Eggs 59μ long by 43μ wide, ellipsoidal, the opercular pole blunter than the posterior pole.

Host.—Delphinus delphis.

Location.—Liver (bile ducts).

Distribution.—Europe.



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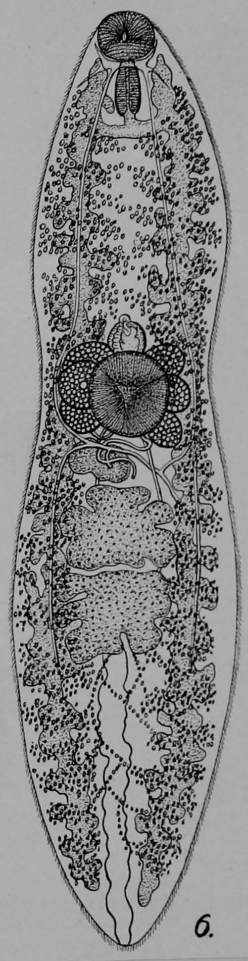


6.

Fasciolidae
Campulinae

Campula folium Ozaki, 1935

Body leaflike in shape, 5.7-7.8mm long 2.4-3.8 mm. broad; both extremities pointed. Surface cuticle 0.02-0.022mm. thick. armed with spines. Acetabular aperature one-fifth to one-sixth of the body length from cephalic margin. Oral sucker terminal smaller than acetabulum. Prepharynx very short with prephryngeal pouch; pharynx inverted pyriform; esophagus inverted Y-shaped. Intestinal ceca many short diverticula on either side, extend to side of pharynx in front, posteriorly to near caudal margin. Testes large, lobed, occupy middle third of the body. Cirrus pouch present extending a little behind the acetabulum. Genital pore, median, in front of acetabulum. Ovary globular to ovid, on right side, in front of anterior testes. Laurer's canal present. Recepticulum seminis vestigeal. Uterus short, fills intercecal area between ovary and genital pore; metreterm shorter than cirrus pouch. Vitellaria lateral, invest the intestinal ceca, coalesce behind the testes. Uterine eggs triangular in cross section 0.062 to 0.079mm. by 0.036 to 0.047 mm. Excretory vasicle tubular; excretory pore caudoterminal. Vesicle and canals together in form of letter Y; canals turn back beside the pharynx.

Habitat: Liver of Neophocaena phocaenoides Gray
Locality: Awashima, Inland sea of Japan

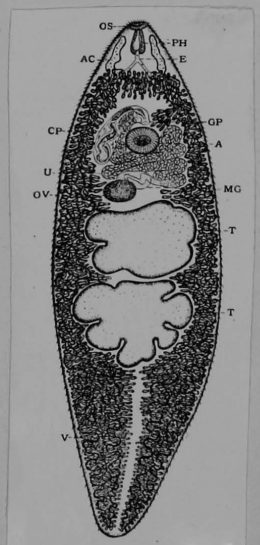


Fig. 9. *Campula folium*. Ventral view. ×19.

CAMPULA DELPHINI (Poirier, 1886) Bittner and Sprehn, 1928

PLATE 2, FIGURES 8–10

Synonyms.—Distomum delphini Poirier, 1886, pp. 34–36; *Cladocoelium delphini* (Poirier, 1886) Stossich, 1892, p. 10; *Brachycladium delphini* (Poirier, 1886) Looss, 1899, p. 558.

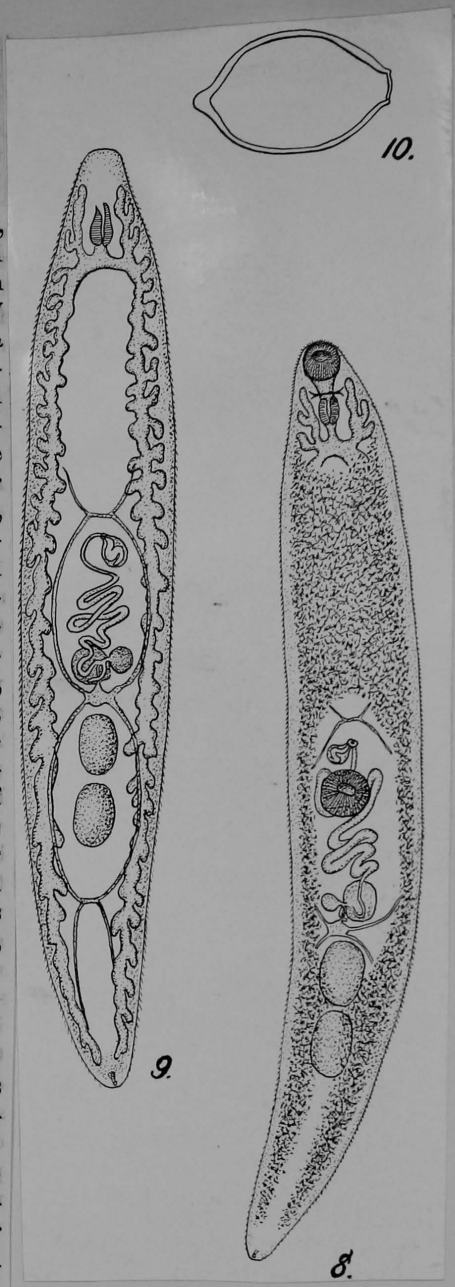
Description.—Campula: Body flat, 14 mm long by 2 mm wide, slightly attenuated at the extremities. Cuticle covered with small slender spines. Suckers about equal in size; acetabulum 700μ in diameter, oral sucker slightly smaller; distance between suckers 7 mm. Prepharynx short and wide; pharynx piriform in shape, 700μ long by 400μ wide; esophagus very short; intestine with short, anteriorly directed ceca, one on each side, which extend to the level of the oral sucker, and long posterior ceca, which extend to the posterior end of the body. The anterior ceca are provided with three more or less well-developed lateral diverticula, and the posterior ceca are provided with short diverticula throughout their course, especially along their lateral margins. Genital aperture median, situated a short distance cephalad of acetabulum; cirrus pouch short and wide, containing the seminal vesicle, short prostatic canal, and a poorly developed ejaculatory duct, and situated entirely in front of acetabulum. Testes large, ovoid, tandem in position, and situated in anterior part of the posterior third of body. Ovary small, spherical, situated cephalad of anterior testis and to the right of median line; Mehlis's gland well developed, to left of ovary; Laurer's canal present. Vitellaria well developed and occupying almost the entire surface of body, both dorsally and ventrally; they are composed of tubular glands entangled to form a compact network; the vitelline ducts unite cephalad of the genital aperture and caudad of posterior testis, and also between ovary and anterior testis where they form the vitelline reservoir. Uterus sinuous, situated between Mehlis's gland and genital aperture. Eggs elliptical, 60μ long by 45μ wide, slightly pointed posteriorly.

Host.—Delphinus delphis.

Location.—Liver (bile ducts).

Distribution.—Europe.

Remarks.—Odhner (1905) was of the opinion that this species was probably identical with *Brachycladium palliatum* Looss (=*Campula palliata*), since he stated: "Ich bin nämlich nicht völlig überzeugt, dass *Br. delphini* nicht mit dem demselben Wirte entstammenden *Br. palliatum* am Ende zusammenfallen könnte. Die Differenze in der Form der Hoden dürfte für das Auseinanderhalten der beiden Arten kaum genügen." Odhner's point regarding the form of the testes is well taken, but there are other characters which appear definitely to eliminate the likelihood of the two species being identical. In *Campula palliata* the uterus forms a rosette mass of coils dorsal to the acetabulum, the egg does not show a definite polar prolongation or thickening, and the anterior and posterior vitelline ducts do not anastomose. In *C. delphini* the uterus lies caudad of the acetabulum, the egg shows a marked polar thickening or prolongation, and the vitelline ducts anastomose anterior to the genital aperture and posterior to the posterior testis. Despite the fact that Poirier's (1886) description of *C. delphini* is so somewhat incomplete, the writer feels that a restudy of specimens of this species will show it to be specifically distinct from *C. palliata* and perhaps to belong to a different genus. Aside from the shape of the ovary and testes, it appears to be more closely related to the genus *Lecithodesmus* than to the genus *Campula*, but the writer prefers to leave it in the latter genus until an examination of specimens of these forms is possible.



CAMPULA ROCHEBRUNI (Poirier, 1886) Bittner and Sprehn, 1928

PLATE 3, FIGURES 11–12

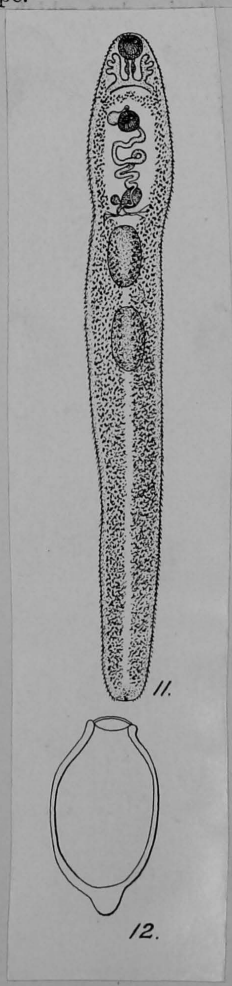
Synonyms.—Distomum rochebruni Poirier, 1886, pp. 36–37; *Cladocoelium rochebruni* (Poirier, 1886) Stossich, 1892, p. 11; *Brachycladium rochebruni* (Poirier, 1886) Looss, 1899, p. 558.

Description.—Campula: Body narrow, 10 mm long by 1 mm wide; ventral surface flat, dorsal surface slightly convex. Cuticle beset with very slender spines, which are especially abundant and close together on the anterior part of body. Suckers equal in size, 380μ in diameter (Poirier gives the diameter as 0.038 mm, but this undoubtedly is an error for 0.38 mm) and 700μ apart. Pharynx 490μ long by 180μ wide; esophagus very short; intestine as in *C. delphini.* Genital aperture immediately cephalad of acetabulum; cirrus pouch short and wide, preacetabular. Testes large, ovoid, tandem in position, and situated near equator of body. Ovary small, spherical, situated cephalad of anterior testis and to right of median line; Mehlis's gland more elongated and situated to left of ovary. Vitellaria composed of anastomosing tubular glands and extending over the greater part of body; the vitelline ducts do not anastomose in the anterior and posterior parts of body as in *C. delphini.* Uterus with few loops, situated between Mehlis's gland and genital sinus. Eggs oval, 82μ long by 45μ wide, strongly pointed posteriorly.

Host.—Delphinus delphis.

Location.—Liver.

Distribution.—Europe.



CAMPULA

Fascioloides Ward, 1917

Generic diagnosis. — Fasciolidae, Fasciolinae: Body very large, broad, thick, without cephalic cone; vitellaria confined to region ventral to cecal branches, otherwise similar to *Fasciola*. Parasites of liver and lung of domestic and wild herbivores.

Genotype: *F. magna* (Bassi, 1875) Ward, 1917 (Pl. 86, Fig. 1044), in "Hirsch"; Mandria. Also in cattle, *Bos elaphus tragocamelus*, *Cervus canadensis*, *C. dama*, *C. elaphus*, *C. virginianus* and *C. unicolor;* Europe, N. America.

Fossaria modicella, *F. m. rustica*, *Pseudosuccinea columella* and *Galba bulimoides techella* experimentally infected; complete development requires 60 days — Krull (1933). Cercaria develops in *Galba bulimoides techella* — Sinitzin (1934). In artifical infestations of *Fossaria parva* and *Stagnicola palustris nuttaliana* in aquaria, cercarial emergence was noted 49 to 58 days from the time of miracidial attack. Sheep, domestic rabbits and guinea pigs were artificially infested — Swales (1935); Almarza (1935). *Lymnaea stagnalis* experimentally infected by exposing to miracidia in Syracuse dishes — Wu & Kingscote (1953). *Stagnicola palustris* an intermediate host in Minnesota — Griffiths (1955). In vitro metamorphosis of miracidium — Campbell and Todd (1955).

FASCIOLOIDES

Fasciolopsinae Odhner, 1910

Subfamily diagnosis. — Fasciolidae: Body large to medium-sized, fusiform, lanceolate or linguiform, with or without cephalic cone. Oral sucker and pharynx comparatively small, esophagus short. Ceca simple, reaching to posterior extremity or not. Acetabulum much larger than oral sucker, close to anterior extremity. Testes branched, tandem, postovarian. Cirrus pouch preacetabular, or long and cylindrical and extending far back of acetabulum. Genital pore postbifurcal or immediately pre-acetabular. Ovary median or slightly submedian, equatorial or pre-equatorial. No receptaculum seminis. Vitellaria extending whole length of ceca, or confined to lateral fields of hindbody. Uterus long or short, coiled between ovary and acetabulum.

Key to genera of Fasciolopsinae

Cephalic cone present; cirrus pouch preacetabular; vitellaria extending whole length of ceca; uterus short ..... *Parafasciolopsis*

Cephalic cone absent; cirrus pouch extending far back of acetabulum; vitellaria confined to hindbody; uterus long *Fasciolopsis*

Faciolopsis Looss, 1899

Generic diagnosis. — Fasciolidae, Fasciolopsinae: Body large, broad, lanceolate to linguiform, without cephalic cone. Acetabulum strongly muscular, produced backward, much larger than oral sucker, close to cephalic end. Prepharynx short, pouch-like, with sphincter muscle. Pharynx globular, esophagus very short. Ceca without dendritic lateral branches, reaching to posterior extremity. Testes with numerous digitiform branches, tandem, intercecal, postequatorial. Cirrus pouch very long, cylindrical, extending in median line far back of acetabulum, enclosing winding tubular seminal vesicle in its greater posterior part, pars prostatica and finely spinose cirrus. Genital pore immediately preacetabular. Ovary branched, submedian, equatorial. Receptaculum seminis absent. Laurer's canal present. Vitelline follicles small, extending in extracecal lateral fields of hindbody both dorsally and ventrally. Uterus coiled transversely in intercecal field between ovary and acetabulum; eggs very large, numerous. Excretory stem with numerous branches. Intestinal parasites of mammals.

Genotype: *F. buski* (Lankester, 1857) Stiles, 1901 (Pl. 97, Fig. 1180), syn. *F. crassa* (Cobb., 1860) Looss, 1899, in man; Asia.

Cercaria develops in *Planorbis coenosus* and *Segmentina largillierti*, encysts on aquatic vegetation — Nakagawa (1922); cercaria with two groups of cystogenous glands (round-celled glands secrete the substance for the outer cyst wall, rhabdoidal-celled secrete that for the inner cyst wall), encysts on caltrop plant and *Eliocharis tuberosa;* pigs experimentally infected — Barlow (1925); metacercaria on two new plants; *Salvinia natans* and *Spirodela* (*Lemna*) *polyrhyza* — Wu (1937).

Other species:

F. fuelleborni Rodenwaldt, 1909, in man; Calcutta, Egypt.

F. goddardi Ward, 1909, *F. rathouisi* Poirier, 1887, and *F. spinifera* Brown, 1917, may be identical with the genotype.

28

28. Fasciolopsis buski (Lankaster, 1857) (по Скрябину, Подъяпольской и Статировой, 1929)

FASCIOLOPSIS

Hadwenius Price, 1932

Syn. *Leucasiella* Krotov et Deliamure, 1952 [1])

Generic diagnosis. — Campulidae, Odhneriellinae: Body very long, slender, cylindrical, spinose anteriorly. Oral sucker and pharynx well developed, esophagus very short, ceca with anterior diverticles but no outer and inner diverticles. Cloaca present. Acetabulum smaller than oral sucker, close to anterior extremity. Testes entire, tandem, in anterior half of body. Cirrus pouch claviform, extending caudad of acetabulum; cirrus spiny. Genital pore immediately pre-acetabular. Ovary entire, median or submedian, pretesticular. Seminal receptacle absent. Laurer's canal present. Vitellaria composed of rosette-like masses of dendritic tubular acini, extending from level of testes or behind it to posterior extremity. Uterine coils confined to intercecal field between ovary and acetabulum; metraterm well differentiated; eggs triangular in cross section, thickened at antiopercular pole. Excretory vesicle tubular, long. Intestinal parasites of cetaceans.

Genotype: *H. seymouri* Price, 1932 (Pl. 83, Fig. 1012; Pl. 89, Fig. 1072), in *Delphinapterus leucas;* Alaska. Skrjabin and Schulz (1925) synonymized this genus with *Odhneriella.*

Other species:

H. mironovi (Krotov et Deliamure, 1952) n. comb., syn. *Leucasiella m.* K. et D., (Pl. 83, Fig. 1007) in *Delphinaptera leucas;* Russia.

H. nipponicus Yamaguti, 1951, in *Phocaenoides dalli;* Sea of Japan.

[1]) Krotov and Deliamure (1952) state that the cirrus pouch extends backward beyond the posterior border of the acetabulum contrary to their figure. Further, they mention that the vitellaria consist of small, irregularly distributed follicles, but their figure clearly shows a typical dendritic arrangement characteristic of *Hadwenius.* It is surprising that they were unable to detect the cirrus spines!

HADWENIUS, new genus

a synonym of Odhneriella Skrjabin

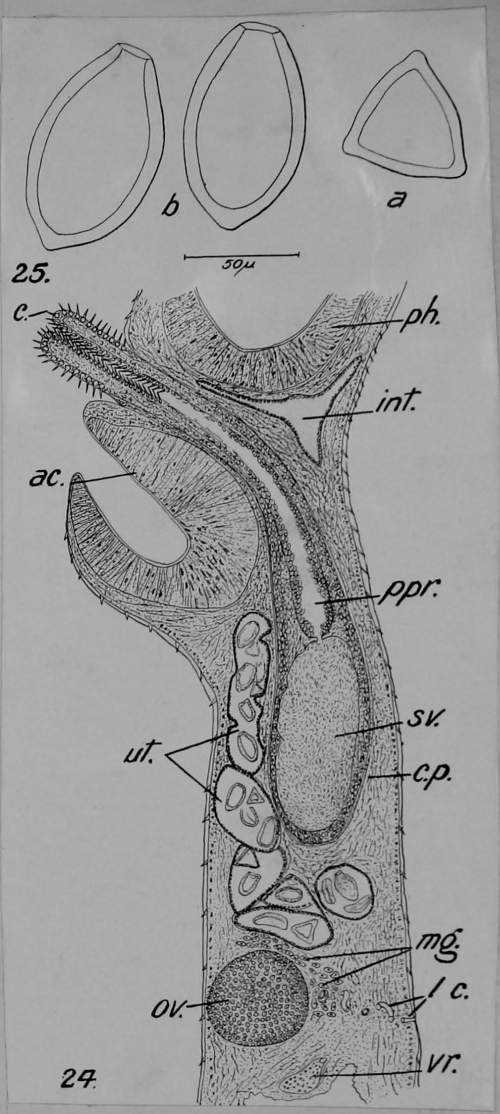
Generic diagnosis.—Campulinae: Body very long and slender, cylindrical, suckers close together; oral sucker slightly larger than acetabulum. Cuticle of anterior part of body spiny. Intestinal ceca without diverticula. Excretory vesicle tubular, extending anteriorly to near posterior margin of ovary. Cirrus pouch pestle shaped, extending caudad of acetabulum; cirrus spiny as in *Orthosplanchnus*. Testes oval, tandem in position, situated in anterior fourth of body. Ovary transversely oval, pretesticular; seminal receptacle absent; Laurer's canal present. Vitellaria composed of rosette masses of radiating cords of follicles, which extend from vicinity of anterior testis to posterior end of body. Uterus with few coils confined to intercecal space between ovary and acetabulum; vagina well developed, unarmed. Eggs triangular in cross section, slightly thickened at posterior pole. Parasites of cetaceans.

Type species.—*Hadwenius seymouri*, new species.

HADWENIUS SEYMOURI, new species

PLATE 6, FIGURES 23–25

Description.—Hadwenius: Body slender, 27 mm to 60 mm long by 1.5 mm to 2 mm wide, and almost circular in cross section. The cuticle of the interior part of the body is spiny, the spines being about 27μ long by 7μ wide and arranged in alternating transverse rows; they are deep-set in the cuticle so that only the tips project above the surface. The rows of spines are close together in the region immediately caudad of the oral sucker, but become farther apart as they approach the region of the anterior testis, where they disappear completely. The oral sucker is cup shaped, 1.8 mm to 2 mm long by 1.7 mm to 2 mm in diameter, the thickness of the wall being about 190μ; the oral aperture is 540μ to 900μ in diameter and slightly subterminal. The acetabulum is transversely oval, 930μ to 1.2 mm long by 1.3 mm to 1.5 mm wide, and the walls are about 180μ thick; the distance between the suckers is from 800μ to 1.6 mm, depending upon the degree of contraction. The length of the prepharynx is variable; in some specimens it is about 810μ long, while in others the pharynx is drawn into the base of the oral sucker so that the prepharynx is very wide and short. The pharynx is 900μ to 1 mm long by 620μ to 900μ wide. The esophagus is very short and wide. The intestine is H shaped as in other members of the subfamily; the ceca are straight and without lateral or median diverticula. The excretory pore is situated at the summit of a papillalike prominence, which projects into a deep pit or depression at the posterior end of the body. The excretory vesicle is similar to that in other members of the subfamily. The genital aperture is situated immediately in front of the anterior margin of the acetabulum; it communicates with a spacious genital sinus. The cirrus pouch is pestle shaped, about 1.8 mm long by 560μ wide; it extends caudad a little more than half the distance between the acetabulum and ovary. The seminal vesicle is about 830μ long by 290μ wide and almost fills the posterior part of the cirrus pouch; pars prostatica slender, about 700μ long, and separated from the seminal vesicle by a sharp constriction; ejaculatory duct relatively short. The cirrus is protrusible and armed with strong spines. The spines are about 40μ long and are inserted into a basal disk which is about 16μ in diameter. Testes oval in shape and situated in the anterior fourth of the body; the anterior testis is 900μ to 1.5 mm long by 620μ to 930μ wide, and the posterior 1 mm to 1.6 mm long by 620μ to 850μ wide, the distance between them being 310μ to 1.2 mm. The ovary is transversely oval, 232μ to 387μ long by 465μ to 590μ wide, situated a short distance cephalad of the anterior testis and to the right of the median line. Seminal receptacle not observed. Laurer's canal is



slender and sinuous, and opens in the mid-dorsal line at the level of the ovary. Mehlis's gland is large and is situated median and dorsal to the ovary. The vitellaria consist of chainlike rows of follicles, which radiate to form rosettelike masses, and extend from the anterior testis to the posterior end of the body; the masses of follicles are distributed on all sides and form a continuous layer beneath the dermomuscular layer of the body. The uterus consists of six or more transverse coils confined to the intercecal field between Mehlis's gland and the acetabulum. The vagina is well developed, unarmed, and about one-half the length of the cirrus pouch; it opens at the base of the genital sinus to the left of the male genital aperture. The eggs are oval, 97μ long by 52μ wide, with a short prolongation at the posterior pole, triangular in cross section.

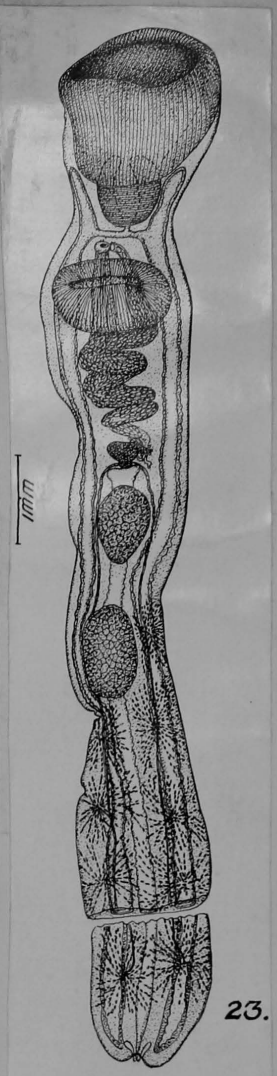
Host.—White whale (*Delphinapterus leucas*).

Location.—Intestine.

Distribution.—North America (Alaska).

Type specimens.—U.S.N.M. Helm. Coll. No. 30807; paratypes, No. 26157. Collected by Dr. Seymour Hadwen, September 9, 1921, at Golovin, Alaska.

Remarks.—*Hadwenius seymouri* appears to be more closely related to *Synthesium tursionis* than to any of the other species of Campulinae. Both are parasites of the intestinal tract of cetaceans and are similar in body form. They differ, however, in two principal characters, which are considered generic, viz, the copulatory organs and distribution of the vitellaria. In *Hadwenius seymouri* the cirrus is armed but the vagina is not, and the vitelline follicles are arranged in rosettelike masses similar to those in *Lecithodesmus*, while in *Synthesium tursionis* both cirrus and vagina are armed and the vitelline follicles are distributed in small grapelike groups. Other differences are present, but these appear to be only of specific value.



23.

Other species Odhneriella rossica Skrj. from liver of Walrus

HADWENIUS NIPPONICUS YAMAGUTI, 1950

RESEARCH NOTE

TWO CAMPULID TREMATODES FROM A NEW HOST, THE HARBOR PORPOISE

During the summer of 1958 a young male harbor porpoise, *Phocaena vomerina* (Gill) 1865, was examined by the authors at the Friday Harbor Marine Laboratories at Friday Harbor, Washington.

The fourth chamber of the stomach contained a large number of campulid trematodes which generally agree with the description of *Hadwenius nipponicus* Yamaguti, 1950. The original description was based on 2 specimens from the small intestine of Dall's porpoise, *Phocoenoides dalli* (True) 1885 in Japan.

Over 100 specimens were recovered from the harbor porpoise and measurements of 10 of these, in millimeters, are as follows (average in parentheses): Body slender, spined at anterior end; length, 13 to 15.9 (14); width at level of acetabulum 0.805 to 0.963 (0.886). Oral sucker terminal, 0.776 to 0.891 (0.840) by 0.603 to 0.718 (0.648); acetabulum 0.575 to 0.718 (0.633) in diameter. Prepharynx 0.287 to 0.575 (0.445); pharynx sub-globular 0.316 to 0.431 (0.351) by 0.287 to 0.348 (0.327). Esophagus from practically lacking to 0.203 (in one specimen). Anterior and posterior ceca simple, the latter opening into the excretory bladder. Genital pore immediately in front of acetabulum. Cirrus sac 0.971 to 1.421 (1.257) in length; cirrus opening into genital atrium on the right side, protrusible, with long spines inserted upon basal discs. Anterior testis smaller or equal to posterior testis, the former 0.560 to 0.826 (0.673) by 0.232 to 0.348 (0.290); the latter 0.647 to 0.826 (0.733) by 0.287 to 0.431 (0.344). Intertesticular space present. Ovary almost round, pretesticular 0.174 to 0.275 (0.222) by 0.175 to 0.290 (0.220). Vitellaria in tubular clusters of follicles usually commencing at the level of the middle of the anterior testis, sometimes at the posterior edge of anterior testis, ending near the posterior tip of the body, anteriormost group of follicles often separated from others. Eggs triangular in cross-section, oval, with truncated anterior pole and knobbed posterior pole; 70 to 82 by 35 to 45 μ.

The present material differs from Yamaguti's 2 specimens as follows: 1) Smaller size of body; in fact, the largest specimen (15.9) is smaller than the smaller of Yamaguti's specimens (17.5). The suckers and internal organs are also regularly smaller. The smaller size may be attributed to the heavy infection. 2) Intertesticular space present while in Yamaguti's specimens the testes were contiguous. 3) More anterior extent of vitellaria. The most anterior extent of the vitellaria in Yamaguti's specimens was the posterior edge of the anterior testis. 4) Egg sizes overlap only slightly. Egg sizes in Yamaguti's specimens were 80 to 90 by 45 to 50 microns.

The liver of the same porpoise contained specimens of *Campula oblonga* Cobbold, 1858. These parasites were numerous both immediately beneath the serous membrane and in bile ducts. This species has been previously reported in *Phocaena phocaena* (L.) of Europe and North America and in *Phocoenoides dalli* of Japan.—HILDA LEI CHING AND EDWARD S. ROBINSON, *Zoology Department, University of Nebraska.*

Reprinted from the Journal of Parasitology, 1959, Volume 45, (2): 181.

HADWENIUS

Hunterotrema ~~n. g.~~ McINTOSH, 1960

Generic diagnosis. Campulidae. Synthesiinae: Body long and slender, subcylindrical, enlarged in area of reproductive organs and at acetabulum, spinose. Suckers well developed. Prepharynx short or absent, pharynx oblong, muscular; esophagus short with a lateral pouch on each side at anterior end; ceca simple, without anterior or lateral branches, extending to near caudal extremity. Testes entire, tandem, in posterior third of body. Cirrus sac long, extending more than half its length posterior to acetabulum; cirrus long; genital pore immediately preacetabular Ovary oval, submedian, immediately anterior to anterior testis. Vitellaria extensive, in a bandlike arrangement in posterior part of body enclosing intestinal crura, but broken ventrally in area of reproductive organs and uterine coils. Uterus with few coils; eggs large. Excretory vesicle tubular. Parasitic in bronchus of freshwater dolphins.

Type species: Hunterotrema caballeroi ~~n. sp.~~ McINTOSH, 1960

DISCUSSION

The new genus, new species described herein has many points in common with *Synthesium tursionis* (Marchi, 1873) for which Dr. Satyu Yamaguti, 1958 (Systema Helminthum) proposed a new subfamily, Synthesiinae. The points in common with the above species are: (1) the long slender spinose body; (2) the arrangement of the reproductive organs and the extent of vitellaria; (3) the long cirrus sac; (4) the ceca without anterior diverticula. Points in which the proposed species differ from *S. tursionis* are: (1) a short prepharynx or none versus a long one; (2) esophagus with lateral pouches versus absence of such pouches; (3) testes entire versus testes deeply lobed; (4) cuticularized excretory ducts in the new species, not mentioned for *S. tursionis*.

Hunterotrema caballeroi ~~n. g., n. sp.~~ Mc INTOSH, 1960

Description. Body subcylindrical, widest area 13.07 mm. long by 1.04 mm. wide in region of anterior testis; narrowest, 0.615 mm. in mid-region between ovary and anterior end; cuticula heavily spined from anterior end to region of reproductive organs; spines lacking in region posterior to testes. Oral sucker cup-shaped, well developed, about 0.4 mm. in diameter and 0.3 mm. deep; acetabulum well developed, 0.6 by 0.65 mm. in diameter; prepharynx short or absent; pharynx 0.4 mm. long by approximately 0.2 mm. broad. Esophagus expanded anteriorly into two lateral pockets; 0.35 mm. long with variable width; intestinal crura long, undulating, extending to near end of body, terminating 0.36 mm. from posterior tip. Excretory pore terminal, opening into a long broad tubular vesicle. A pair of serpentine cuticularized excretory ducts approach region of excretory pore, connection not observed; in cross sections four such ducts noted, a pair dorsal and a pair ventral, to ceca in area posterior to testes. Reproductive organs and vitellaria in posterior third of body. Anterior testis transverse oval, 0.80 mm. by 0.62 mm. in diameter, located 2.66 mm. from posterior end of body; posterior testis elongate oval, 0.833 mm. by 0.62 mm. in diameter, located 1.77 mm. from posterior end of body. Cirrus sac 2.11 mm. long by 0.52 mm. wide, extending more than half its length posterior to ventral sucker; cirrus long, estimated length 2.72 mm., diameter 0.1 mm.; seminal vesicle large; genital pore median, immediately in front of acetabulum. Ovary transverse oval, 0.384 mm. by 0.675 mm. in diameter, situated immediately cephalad of anterior testis. Receptaculum seminis uterinum present; Laurer's canal, Mehlis' gland, and vitelline reservoir anterior and dorsal to ovary. Vitellaria confined to posterior region of body, extending from near posterior end of intestinal crura to about 1.3 mm. cephalad of ovary; uniformly distributed dorsally and ventrally, but absent ventrally in area of uterus and reproductive organs. Uterus ventrally situated with mass of coils immediately cephalad of ovary, then extending from region of vitellaria as an undulating tube to metraterm; metraterm ventral to cirrus sac, apparently unarmed. Eggs oval, 110μ by 70μ, lemon yellow.

Habitat: Amazon dolphin, *Inia geoffrensis*, "in the mucus in the bronchus".

Distribution: South America.

Specimens: U.S.N.M. Helm. Coll. No. 39023, type and paratypes.

Herein is described a new species of trematode representing a new genus of the family Campulidae Odhner, 1926. The species is based on three entire specimens and two fragments of two additional specimens, one of which had been sectioned when received. The specimens were received for identification from Dr. George W. Hunter, III, Lecturer in Biological Science and Medicine, University of Florida, Gainesville, Florida. The host had recently died and was examined post mortem at the university. The trematodes were found in the mucus in the bronchus.

FIG. 1. *Hunterotrema caballeroi* n. g., n. sp.: ventral aspect.

Hunterotrema macrosoma, ~~new species~~ DAILEY, 1971

Figures 1-5

Description based on measurements from 15 specimens.

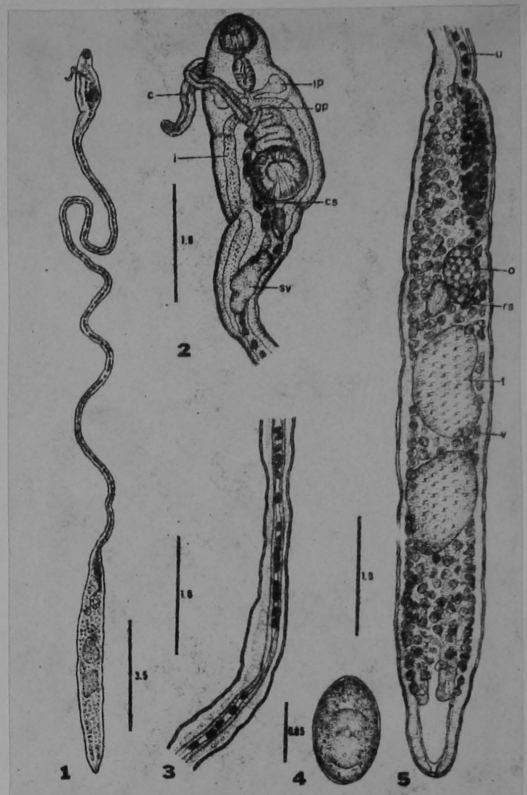
Diagnosis: Body slender, elongate, 31 (24-36) long, with distinct forebody 3.7 (3.1-4.7), mid-body 19.6 (12.2-25.4) and hindbody 7.8 (6.0-9.8). Maximum body width 1.1 (0.74-1.46) at acetabular level, hindbody 1.0 (0.53-1.5) in region anterior testis. Spines lacking. Oral sucker, well developed, circular and subterminal 0.34 (0.30-0.40) in diameter. Prepharynx short, pharynx 0.32 (0.30-0.36) long by 0.19 (0.17-0.24) wide. Esophagus expanded anteriorly into two lateral pockets, 0.35 long (from midesophagus) by approximately 0.20 wide at ends (variable). Acetabulum, well developed, circular, 0.58 (0.50-0.67) in diameter. Cirrus long, unarmed. Cirrus sac 2.0 (1.8-2.1) long by 0.52 (0.43-0.60) wide, extending less than half its length posterior to acetabulum. Ovary oval, just cephalad to anterior testis, 0.33 (0.28-0.46) long by 0.35 (0.30-0.50) wide. Receptaculum seminis large, lateral to ovary. Seminal vesicle large, genital pore anterior to acetabulum just posterior to cecal bifurcation. Testes confined to median and posterior half of hindbody. Anterior testis 0.92 (0.65-1.15) long by 0.69 (0.48-0.98) wide. Posterior testis 1.03 (0.75-1.29) long by 0.71 (0.52-0.88) wide. Vitellaria, uniformly distributed, confined to hindbody, extending from posterior end of intestinal cecae to anterior constriction of hindbody. Uterus coiled immediately anterior to ovary, then straightens to run as a sinuous tube to genital pore. Eggs oval 108μ (105-112) by 62μ (58-66).

Host: Inia geoffrensis

Location: Lungs

Locality: Amazon river basin, Leticia, Columbia and Iquitoz, Peru.

Holotype and Paratypes: USNM Helm. Coll. Nos. 71583 (holotype), 71584, 56921, 56922.



Figures 1-5. Hunterotrema macrosoma, new species. Fig. 1. Ventral view of entire worm. Fig. 2. Forebody. Fig. 3. Mid-body. Fig. 4. Egg. Fig. 5. Hindbody. Abbreviations: c — cirrus; cs — cirrus sac; gp — genital pore; i — intestinal ceca; lp — lateral pockets of esophagus; o — ovary; rs — receptaculum seminis; sv — seminal vesicle; t — testis; u — uterus; v — vitellaria.

DISCUSSION

Currently the genus *Hunterotrema* is represented by a single species, *H. caballeroi* McIntosh, 1960. *Hunterotrema macrosoma* differs from *H. caballeroi* in the following characters: (1) length and width of body (*H. caballeroi* 13.07 long by 1.64 maximum width); (2) lack of cuticular spines (*H. caballeroi* heavily spined from anterior to region of reproductive organs); (3) placement of genital pore (immediately anterior to acetabulum in *H. caballeroi*); (4) cirrus sac not extending more than half its length posterior to acetabulum as in *H. caballeroi*.

Since both familiar (Campulidae Odhner, 1926) and generic diagnosis included the presence of spines, an emendation to both is proposed to include *H. macrosoma* and should read "Cuticular spines present, or lacking."

Woodard *et al.*, (1969) described the pathology of pulmonary trematodiasis in an Amazon river dolphin from Iquitoz, Peru. The photograph and measurement (printed, in error, as "approximately 250 mm in length" but corrected by Dr. Stephen Zam, University of Florida [pers. comm.] to be 25 mm) indicates the trematodes involved in the report were *H. macrosoma*, not *H. caballeroi*.

— OVER —

During investigations on marine mammal helminths, numerous lung trematodes taken from the Amazon river dolphin *(Inia geoffrensis)* were given to me for identification by Dr. Sam Ridgway, Naval Undersea Research and Development Center, Point Mugu, California. The specimens were found to be similar to, but much larger than, *Hunterotrema caballeroi* McIntosh 1960. McIntosh (1960) described *H. caballeroi* from 3 entire worms and 2 fragments of 2 additional specimens. The type material and additional specimens were obtained on loan from the USNM Helminth Collection, Beltsville, Maryland. A comparison of those 6 specimens not designated as part of the type-series (USNM Helm. Coll. Nos. 56921, 56922) with this material indicated a similarity between these forms. Both groups differed from *H. caballeroi* sufficiently to warrant a new species description.

The worms from Dr. Ridgway had been fixed in 10% formalin, whereas, those received from Beltsville were in 70% ethanol. Whole mounts were stained in Semichon's carmine or celestine blue B, dehydrated in ethanol, cleared in xylene and mounted in piccolyte. Drawings were made with the aid of a drawing tube. All measurements are given in millimeters unless otherwise stated. Average measurements are presented with ranges in parentheses.

HUNTEROTREMA

Lecithodesminae n. subfam. Yamaguti, 1958

Subfamily diagnosis. — Campulidae: Body long, slender or lanceolate, spinose. Oral sucker small, prepharynx present, esophagus very short. Ceca with anterior outer and inner outpocketings. Acetabulum small, nearer to midbody than to anterior extremity. Testes tandem, in posterior half of body. Cirrus pouch preacetabular or extending slightly posterior to acetabulum. Genital pore preacetabular. Ovary slightly submedian, pretesticular. Seminal receptacule? Vitellaria consisting of quadrangular groups of follicles, extending both dorsally and ventrally from region of pharynx to posterior extremity. Uterus convoluted in intercecal field between ovary and genital pore; eggs triangular in cross section. Excretory vesicle tubular, long.

Genus LECITHODESMUS Braun, 1902

Generic diagnosis.—Campulinae: Body long, slender, and flattened dorsoventrally. Suckers widely separated. Intestinal ceca provided with median and lateral dendritic diverticula. Cirrus pouch extending slightly beyond posterior margin of acetabulum; cirrus unarmed; testes branched. Ovary deeply lobed; vitellaria in quadrangular groups of follicles extending from region of pharynx to posterior end of body. Parasites of cetaceans.

Type species.—*Lecithodesmus goliath* (van Beneden, 1858) Odhner, 1905.

Lecithodesmus Braun, 1902

Generic diagnosis. — Campulidae, Lecithodesminae: Body long and slender or lanceolate, flattened dorsoventrally, spinose. Oral sucker subterminal, followed by short prepharynx; pharynx more or less elongate; esophagus very short; ceca with anterior diverticles as well as outer and inner diverticles. No cloaca. Acetabulum subequal to oral sucker, situated more than one-third of body length from anterior extremity. Testes entire or branched, tandem, in posterior half of body. Cirrus pouch claviform or saccular, pre-acetabular or extending slightly beyond posterior margin of acetabulum; cirrus unarmed. Genital pore pre-acetabular. Ovary lobed or not, slightly to right of median line. Seminal receptacle? Laurer's canal present. Vitellaria consisting of quadrangular groups of follicles, extending both dorsally and ventrally from region of pharynx to posterior extremity. Uterus convoluted in intercecal field anterior to ovary and in vicinity of acetabulum; eggs large, triangular in cross section. Excretory vesicle tubular, long. Parasitic in bile ducts of cetaceans; Atlantic and Pacific.

Genotype: *L. goliath* (van Beneden, 1858) Odhner 1905 (Pl. 97, Fig. 1172), in *Balaenoptera borealis*, B. *acutorostrata*, and *Balaena musticetus;* Europe.

Other species:

L. delphini (Poirier, 1886), syn. *Campula d.* (P.) Bittner et Sprehn, 1928; *Cladocoelium delphini* (P.) Stossich, 1892, in bile ducts of *Delphinus delphis;* Europe.

L. nipponicus Yamaguti, 1942, in *Delphinus longirostris* and *Globicephalus scammoni;* Japan.

L. palliatus (Looss, 1885), syn. *Campula p.* (L.) L., 1901; *Brachycladium p.* (L.) L., 1899; *Cladocoelium p.* (L.) Stossich, 1892, in bile ducts of *Delphinus delphis;* Europe.

L. spinosus Margolis et Pike, 1955, in *Balaenoptera borealis;* Canadian Pacific.

LECITHODESMUS GOLIATH (van Beneden, 1858) Odhner, 1905

PLATE 3, FIGURES 15–16

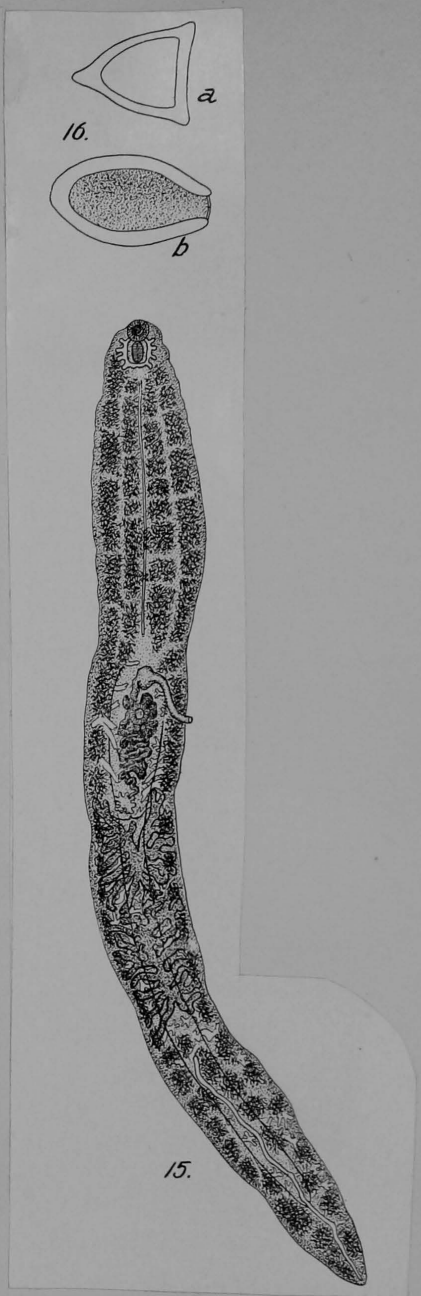
Synonym.—Distomum goliath van Beneden, 1858, pp. 95–97.

Description.—Lecithodesmus: Body ribbonlike, 60 to 80 mm long by 8 mm wide and 1.6 to 1.8 mm thick (90 mm long by 9 mm wide, according to Lönnberg, 1891), anterior end bluntly rounded and posterior end slightly attenuated. Spines present on anterior part of body. [Odhner (1905) believes that the absence of spines on the posterior part is due to the effects of maceration for several days of habitual delay before specimens can be collected after the host has been killed.] Oral sucker 2.3 mm in diameter by 2 mm deep, subterminal in position; acetabulum 1.8 mm in diameter by 1.6 mm deep, according to Odhner (1.3 mm in diameter, according to Braun, 1902b), situated a little more than one-third of the body length from the anterior end (28 mm from oral sucker, according to Lönnberg). Prepharynx short; pharynx 1.5 mm long by 950μ wide (700μ wide, according to Braun); esophagus very short; intestinal ceca extend to posterior end of body and are provided with median and lateral dendritic diverticula. The anteriorly directed cecal appendages extend to the level of the middle of the pharynx, each being provided with four lateral diverticula. Excretory vesicle tubular and extending to level of ovary. Genital pore preacetabular; cirrus pouch club shaped, containing a large seminal vesicle and an unarmed cirrus 3 mm to 4 mm long. Testes branched, tandem in position, and situated in the posterior half of the body. Ovary star shaped, situated immediately cephalad of the anterior testis, slightly to right of median line. Laurer's canal present; seminal receptacle (?). The vitellaria consist of quadrangular groups of follicles extending both dorsally and ventrally from the level of the pharynx to the posterior end of body. According to Braun, the vitelline ducts consist of a long, slender, anterior duct, which bifurcates to form two lateral ducts that extend to a short distance caudad of ovary where they join the transverse ducts, and of a shorter, unpaired, posterior duct which bifurcates to form anterior lateral ducts which are sometimes connected by transverse anastomoses; the transverse ducts are formed by the union of the anterior and posterior lateral ducts. Uterus convoluted and terminating in a well-developed vagina, which opens into the genital sinus near the male genital aperture. Eggs 120μ long by 75μ wide, triangular in cross section.

Hosts.—Balaenoptera acutorostrata (=*B. rostrata*), *B. borealis*, and *Balaena mysticetus*.

Location.—Liver.

Distribution.—Europe.



see also Braun (1902) – reprint

LECITHODESMUS

Leucasiella arctica
Delyamure & Kleinenberg, 1958

1746—DELYAMURE, S. L. & KLEINENBERG, S. E., 1958. [Krimski pedagogicheski institut, U.S.S.R.] [A study of the helminth fauna of the white whale (*Delphinapterus leucas*) in the south-eastern part of the Barents and Kara Seas.] **Papers on Helminthology presented to Academician K. I. Skryabin on his 80th Birthday. Moscow: Izdatelstvo Akademii Nauk SSSR,** pp. 123–126. [In Russian.]

The following are recorded from 49 white whales from the Kara Sea: *Leucasiella arctica* n.sp., *Odhneriella seymouri*, *Diphyllobothrium lanceolatum* (deformed specimens), *Anisakis kükenthalii*, *Otophocaenurus oserskoi*, *Stenurus arctomarinus*, *Terranova decipiens*, plerocercoids of *Pyramicephalus phocarum* and larval or immature *Anisakis* sp., *Contracaecum* sp. and *Porrocaecum* sp. No acanthocephalan was found. *D. lanceolatum*, *T. decipiens* and all larval forms are new host records. The new species, which was present in the rectum of 16·3% of the whales, is differentiated from *L. mironovi* by the large deeply lobed testes, the larger ovary (0·20 mm. to 0·43 mm. in diameter) and eggs (0·095 mm. to 0·106 mm. × 0·049 mm. to 0·060 mm.) and the vitellaria which reach to the ventral sucker; and from the second species in the genus, *L. subtila*, by the smaller body (6·8 mm. to 8·0 mm.), pharynx (0·35 mm. to 0·55 mm.), prepharynx (0·30 mm. to 0·35 mm.) and genital bursa (1·13 mm. to 1·72 mm.), by the extent of the vitellaria and by the presence of body spines.

G. I. Pozniak

рается вперед за середину брюшной присоски. Циррус не вооружен.

Яичник круглый или почти круглый, 0,20—0,43×0,20—0,41 мм, лежит впереди семенников. Рядом с ним расположено тельце Мелиса. Желточники в виде мелких фолликулов, не образующих розеток, занимают всю вторую половину тела и простираются вперед до заднего или переднего уровня брюшной присоски. Матка образует несколько петель между яичником и брюшной присоской. Яйца овальные, на поперечном сечении треугольные, размером 0,095—0,106×0,049—0,060 мм, с утолщением скорлупы на полюсе, противоположном крышечке.

Дифференциальный диагноз. Род *Leucasiella* Krotov et Delamure, 1952 в настоящее время состоит из двух тихоокеанских видов: *L. mironovi* Krotov et Delamure, 1952 и *L. subtila* A. Skrjabin, 1958.

От *L. mironovi* наш вид отличается более крупными лопастными, глубоко изрезанными семенниками, более крупным яичником и более крупными яйцами, желточниками, простирающимися до уровня брюшной присоски; наш вид констатирован у белух Баренцова моря, а *L. mironovi* — у белух Охотского моря.

От *L. subtila* наш вид отличается меньшими размерами тела и наличием на нем шипов, меньшим фаринксом, префаринксом, гораздо меньшей половой бурсой, желточниками, простирающимися на область матки и брюшной присоски; наш вид, как было сказано, констатирован у белух Баренцова моря, а *L. subtila* — у косаток (*Orca orca*) Тихого океана.

Чаще всего и в огромных количествах белух Баренцова и Карского морей поражает нематода, паразитирующая в желудке, — *A. kükenthalii* (51,1%); на втором месте стоит трематода *L. arctica* nov. sp. (16,3%), паразитирующая в прямой кишке; на третьем — псевдалииды *O. oserskoi* (слуховые полости) и *S. arctomarinus* (легкие — 6,1—4,0%), на четвертом — остальные виды.

Анализ гельминтофауны белух в целом показал, что она состоит, с одной стороны, из видов, исключительно свойственных белухам (*O. seymouri*, *L. mironovi*, *L. arctica*, nov. sp., *A. kükenthalii*, *O. oserskoi*, *S. arctomarinus*), а с другой — из видов, паразитирующих у других морских млекопитающих (*C. giliakiana* — у бутылконоса, *S. minor* — у морских свиней) или вовсе не характерных для белух, как правило, паразитирующих у ластоногих (*D. lanceolatum*), у кашалота и усатых китов (*A. simplex*)

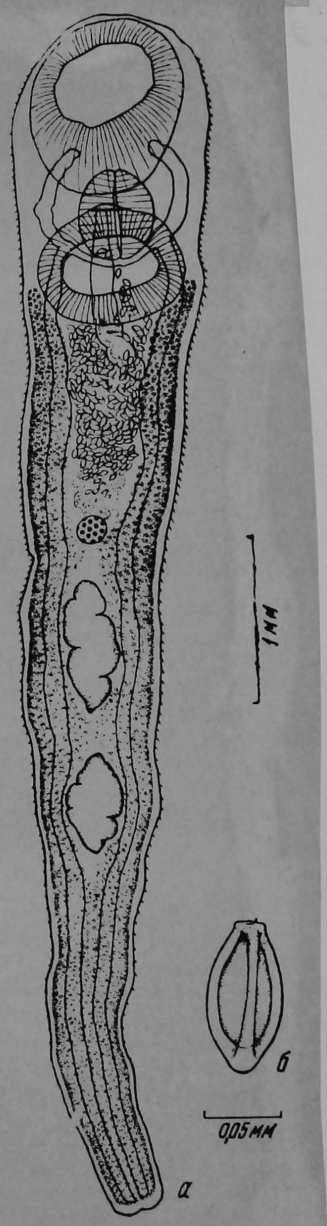


Рис. 1. *Leucasiella arctica* nov. sp.
а — марита; *б* — яйцо

LEUCASIELLA